The Ubiquitousness of Prey-Predator Relationship (PPR), the Law of Purposive Association and Fundamental Questions in Evolution

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Abstract

Objectives: To generalize Prey-Predator Relationship (PPR) so that entire evolutionary process can be interpreted as a chain of Prey-Predator Relationships working by a law of mutual purposive association. **Methods**: Analysis and generalization of Prey-Predator Relationship, Meta-evolutionary analysis of evolution of life as well as of species using generalized Prey-Predator Relationship. **Findings**: The evolutionary urge proceeding from the cosmic mind manifests in the nonliving resulting in emergence of life and in the living leading to evolution of species. Progressive evolution of humans and beyond the human stage by the generalized Prey-Predator Relationship operating in the domain of the mind to gradually eliminate instinct and intellectleading to evolution of fintuition. Successive evolutionary stages are found to be atom-molecule, molecule-macromolecule, macromolecule-life, life-instinct, instinct-intellect and intellect-intuition in that order. Certain important commonalities like common phylum etc. are found to be the bases of purposive association. Both prey and predator evolve through their relationship. **Applications/Improvements:** We generalize Prey-Predator Relationships to include elimination of qualities or traits rather than mere consumption of prey by the predator. We propose a law of purposive association to explain evolution of life from non-living and the entire course of evolution of species up to the human stage and beyond.

Keywords: Domestication, Evolutionary Urge, Meta-Evolution, Parasitism, Prey-Predator Relationship, Purposive Association

1. Introduction

Maintenance of a steady population of a species in a particular natural environment is referred to as population homeostasis¹. The factors involved in it are: 1. Competition for theavailable resources like food and water, 2. Predation byother animals, 3. Parasites and diseases and 4. Limitingphysical factors like reproductive capacity of species and the carrying capacity of the environment and also natural

disasters². Are these factors somehow planned by nature in a decisive way and do they operate to different required degrees as per the increase and decrease of the numerical and functional output of the species?

Several gaps exist in our understanding of the phenomenon of population homeostasis. For example, a population of guppies (a fish) kept in tanks was provided with ample food and there was no predation or disease, yet after certain population number was reached the fish

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resorted to cannibalism³. Is the population control mechanism genetically ingrained in the species and there is a corresponding instinct in them to maintain population at an optimum level if natural population control mechanism is postponed by artificial interference?

Predators such as lions and tigers are no prey to any predator and as such they are also not usually getting subjected to many life-threatening diseases and yet they are able to maintain a stable population level in a natural setting without much human intervention. In such situations, do they exercise restraint to limit reproduction to avoid possible over-utilization and resulting scarcity of the available resources?

Populations are regulated by environmental and biological factors. Environmental factors include abiotic factors and biological factors include predation, disease and socio psychological factors. What is the purpose of population homeostasis mere population control or evolution?

In ecosystems with high biological diversity, which are not physically stressed, populations are usually biologically controlled. Such population control mechanisms are of two categories: 1. Density independent and 2. Density dependent². The accepted explanatory models assume that biotic factors such as competition, predation and parasitism are density-dependent. The biological aspects of population interactions are thus Prey-Predator Relation (PPR), Producer-Consumer Relation (PCR), Host-Parasite Relation (HPR) and they play a great role in maintaining population density.

Here the question arises: Are the competing species aware of their total number and area of the habitat so as to act in a density dependent way? Similarly in PPR, do the species act consciously being aware of their relative densities? Don't they just keep acting instinctively irrespective of what their densities are?

Coming to parasitism, does the parasite know about host population to infect them accordingly? What is the root cause behind the density dependence of the determining factors? Behind all these factors, is there a different factor playing its decisive role through a planned evolution mechanism? Are all climatic factors also density dependent? Does climate have its own mind to acknowledge density or does it primarily act for other important reasons without taking into account the numerical and functional aspect of all the species of a particular affected region, but through that somehow the density gets affected?

Lastly, when there is decrease in population of a particular species, somehow the national Governments are driven to enact wildlife protection acts to protect and preserve that species! Does nature act and govern the balance of tiger or elephant population through human minds and national Governments also?

We propose that behind each of these factors there lurch the deep psychological aspects at the level of the individual, the species, the Governmental and the cosmic, which have not been studied earlier and only recently to some extent been introduced and dilated upon by us^{4,5}. The entire evolutionary history of the whole cosmos, of life, of species and even of individuals, can all be described on the basis of an evolutionary urge and a law of purposive association which follow from an analysis of generalized Prey-Predator Relationships.

2. Inter-specific Interactions

Inter-specific interactions are classified as positive or negative according as whether they have a positive or negative value for the species. For example, commensalism and symbiosis are positive interactions while HPR, PCR and PPR can be negative and they play an important role in population regulation.

HPR involves two different species, a parasite on a host, in which the parasite is supposed to be benefitted and the host harmed. But, does the parasite play any other role as per nature's law? Does it make the host more immune and fit for the environment? Does it eliminate the poorer and select the better ones? On the other hand the host only supplies the parasite with its survival or does it also plays a role in improving parasite immunity too through host-parasite fight to succeed? It seems logical to suppose that HPR is designed by nature to make both species grow through such interaction. Nature's design of interaction is such that their densities vary with time in an oscillating manner, which falls under the universal harmonic time dependence of stationary states on quantum theory.

The prey-predator dynamics is explained as herbivore-host, parasitoid-host, herbivore-carnivore and carnivore-carnivore interactions. They are biologically characterized by oscillation in population size of both predator and prey. There may be several possibilities such as the prey population grows to a peak when predator is absent; the predator population will starve and dwindle in number in the absence of prey population in case of unavailability or unsuitability of another type of prey; predator consumes prey as per its hunger (requirement) and not as per availability of prey. However, the functional response that is observed is that a predator's consumption rate changes in specific ways as prey density changes⁶.

This interaction continues both in homogenous environmental condition as well as in heterogeneity too. However, heterogeneity in environment is more significant with regard to their evolution², because, the heterogeneity influences the efficiency of both prey and predator. If predator gains more efficiency in capturing prey, simultaneously there is increase in the efficiency of the prey in avoiding capture by the predator. Thus nature hones the adaptive skills of both prey and predator.

This is somewhat similar to what happens in Quantum Physics: the particle and wave nature of the quanta always coexist but in a complementary manner according to Bohr's complementarity principle. Similarly in nature, the producer-consumer, host-parasite and prey-predator populations continue to coexist in such a manner that if one predominates, the other dwindles⁸.

Further, in general, neither predator nor prey has to be an animal. Thus the generalized definition of PPR allows for a discussion of the evolutionary mechanisms that might have been operating long before crown-group animals came up, before the shift from prokaryotes and protist predators during early phases of evolution to multi-cellular suspension/filter feeders and grazers on planktonic and benthic microbes and finally to macrophagic predators, the animal eating animals.

3. Evolutionary Urge and Generalized PPR

Though interactions between organisms are generally regarded as a major factor in evolution, any clear explanation is lacking as to how such interactions lead to different rates of evolution^{9,10}. For example, successful predation, by definition, leads to the biological death of the prey. The evolutionary effects are stronger in prey than in predator taxa^{11,12}. At each encounter, the prey risks its life, the predator only its meal-the "life-dinner principle" of Dawkins and krebs¹³! But, this line of argument, by itself, is not sufficient to explain why evolutionary effects are stronger in prey compared to the predator. As the core purpose of life is evolution, the law of nature has designed the prey-predator interaction for evolutionary purposes. The traits that enhance a predator's ability to find and capture prey will be selected for in the predator, while traits that enhance the prey's ability to avoid being eaten will be selected for in the prey. Thus, predator-prey interaction helps their evolution.

It is true that the inequality of the inner requirements of the organisms during such interactions leads to the differences in their rates of evolution. We propose that such inequality of requirements exists because of the fact that the urge for succeeding in fighting for life is more intense than the urge for fighting for a meal⁵. It is the relative intensity of the urge that determines the evolutionary impact of a particular interaction.

Further, it has been observed that the introduction of predators may cause rapid evolution of various defensive characters in the prey species^{14,15}. Here the question arises: How were predators introduced into nature? Did they come up later than the prey into the system? Are not PPR a design and a plan for the evolution of both?

So, consideration of the role(s) of predation in early evolution set against paleontological data help us reinterpret and re-evaluates the hypothesis regarding the coming into existence of PPR as a holistic process in evolution. Biologists hypothesize the role of predation as a driving force in evolution from an almost exclusively microbial biosphere to one characterized by multi-cellular organisms and the complex food webs of modern ecosystem. Is it true that PPR is a driving force in evolution? Or, is evolution an independent, eternally existing, cosmic pathway through which all organisms are definitely destined to pass, by getting interlinked by the network of PPR to evolve?

Is it at all possible to get complete information about the nature of the encounters between predator and prey? Every existence here is because of a link between prey and predator. The design is infinitely complex and plan cosmic. Biologists admit that during most periods, direct evidence of predation is lacking. They claim this on the basis of fossil records that are scarce and being mostly microbial records, the mode of life cannot in general be deduced from their morphology. For example, the fossil records are generally silent with regard to animals older than about 600 million years. Does that suggest that life did not exist prior to it? Or, can we conclude that animals or animal-like organisms or PPR did not exist earlier? Because there is no direct evidence of predation in an era, does it mean that there was no predation in that era?

Similarly, just because we have not so far found direct empirical evidence of the infinitude of the cosmic plan of manifestation of the universe, we can't say that it does not exist. The subjective time and perceptions are limited^{16,17}. Our urge-based analysis of evolution suggests that life has always existed and that it has been existing through PPR only, whether it is engulfing a whole multi-cellular organism or a bio-molecule or a proto bio-molecule or a portion of something, which is the prey necessary for its survival.

In our view, PPR, properly understood and generalized, is all-pervading and the whole world is nothing but a huge interconnected chain and network of PPRs, starting from the inanimate to the entire range of animate species that have ever been in existence since time immemorial. In doing this generalization, we leave the crude ground of killing of the prey and move above it to the elimination of characters or traits or qualities in the prey, by the predator which can be any higher evolved object or idea having those necessary higher characters or traits or qualities. For example, in a human being, when animal instinct dies, human intellect wakes up and when human intellect dies, divine intuition wakes up. It does not mean a physical death of the person, but a waking up to a higher plane of evolution in the same physical body. Only in the carnivorous case, an animal needs to be eaten whole in PPR, thereby ending its individual existence by predation. The lower gives way to the higher – this is generalized PPR.

We explain the causalities and triggers of the interplay of the PPR and subtle mechanisms of evolution of the organisms functioning through the interlinking chain, web of the modes of their life as being due to the operations of an evolutionary urge inherently present in all things and beings. This evolutionary urge utilizes PPRs by the law of purposive association with the higher and brings about evolution of the lower. The higher may or may not be available in physical form and may be in the domain of the cosmic mind or the morphic field, but nevertheless exists and the lower evolved species purposively associate with that higher morphic form for satisfying their evolutionary urge^{4.5}.

4. Generalized PPRs and the Law of Purposive Association

The urge for continuation of existence seen in all living creatures can be seen to be present in a most incipient stage – even in purely inanimate particles (matter). Material systems interact via fundamental physical forces namely gravitation, electromagnetism, and strong nuclear and weak nuclear forces in order to achieve a minimum energy state which will grant increased stability. This general feature of movement towards stability from relatively higher energy unstable configurations can be called the principle of stability and it is nothing but the effect of the inherent urge for continuation of existence of every system operating through that system.

In living creatures, this urge for continued existence becomes the urge for self perpetuation through definite purposeful interactions with the environment. This result in the various modes of interrelationship such as symbiosis, PCR, HPR, PPR etc. that are observed to exist amongst species in different strata of evolution. We now focus our analysis on unifying all the myriad relationships under the umbrella of the most generalized prey-predator-relationship that paves way for the enunciation of the law of purposive association:

4.1 All Associations in Nature are Purposive, the Purpose Being Evolution

It is not difficult to appreciate the truth of this if we but make an impartial observation of ourselves and see how different organisms have benefited from association with those having higher endowments. The less evolved have to sacrifice something partially at least – be it their characters or possessions, in order to be associated with the more evolved. In the following we illustrate how this law is capable of explaining many evolutionary questions which are so far unanswered. Even a negative association like dissociation or disassociation is meant to pave way for some evolution of the entities involved.

4.2 Atom-Molecule PPR and Emergence of Order

The comparatively more stable forms in the inanimate material world and the self replicating macromolecules are the better survivors compared to their less stable, higher energy aggregates and non self-replicating counter parts. In a sense, PPR begins from here itself. The survivors are the predators and contributors to their survival are the prey, the environmental factors such as temperature and pressure etc. being the determinants of their population. The self-replicating macromolecules serve as substratum for the manifestation of life.

This movement towards stability leads to the formation of ever larger aggregates from fundamental particles to atoms, from atoms to molecules and finally to self replicating macromolecules like proteins, amino acids and other bio-molecules, wherein the urge for continuation of existence attains its highest expression as far as nonliving systems are concerned.

Obviously, these macromolecules are more ordered configurations of their constituents than a collection of smaller aggregates. This increase of order corresponds to a decrease in entropy and grants dynamic stability to them. Such more ordered, lower energy configurations can replicate themselves by definite interactions with the environment. By purposefully associating with each other for becoming larger aggregates by sacrificing their individuality, they ensure their survival more certainly than by remaining as small individual units.

5. Matter-Life PPR and Emergence of Life

Once the self-replicating macro-molecules are available, there comes searching a next higher category of existence, metaphysical in character and remaining as a pervasive field in all living organisms, called life or vitality or vital force, which processes them and starts functioning in purposeful manner to perpetuate itself through taking up one complex aggregate of such self-replicating molecules to another, finally ending up in unicellular plant life forms. Then on, it grows into successively more and more complex configurations with roots, stems, branches, leaves, flowers and fruits, seeds etc. in different stages of evolution. The nature of this elan vital is not clear and it may have something to do with the electromagnetic nature of cellular processes and interactions responsible for the maintenance of life of any organism^{18.19}.

When functioning as a particular life-form it is a structured Localized Field Pattern (LFP), a term coined by Pockett²⁰. It existed in the molecular aggregates as bonds between atoms and now it has become more complex, endowed with an organizing capacity to maintain itself. In terms of PPR, the principle of life, as it were, preys upon the inanimate aggregates in the process of perpetuating itself, possess them and utilizes them purposefully in that direction. Animates prey upon the inanimate. The inanimate, in their turn, are able to maintain their complex aggregate configurations for a longer period in spite of environmental hazards by virtue of homeostasis and other life-sustaining processes, against which the elan vital works to maintain itself through them. Thus, they have also gotten the advantage of being associated with the higher ordering principle of life by which their form is perpetuated, which they were doing by self replication but

were subject to more environmental hazards than when they are in a living organism as substrates for life to throb. The non-living objects associate purposefully with the living to partake of life, which automatically guarantees their perpetuation by replication.

6. Life-Mind PPR and Evolution of Herbivores

The life in plants becomes fodder for another higher level of existence, the mind, to start thriving on it by taking up animal forms. This marks the beginning of herbivory. All the various parts of plants become, as it were, an invitation to the quenching of hunger instinct in the herbivorous species. The sensation in plants evolves into instinctive activity in animals by being used as food; the plants ensure their survival in more ways than one through the very animals that prey upon them.

While the lower animals are instinctive eaters of plants, they naturally leave the place when they find insufficiency, thereby allowing the plants to grow back to their sufficiency, again, while rational animals like humans cultivate the plant species on which they depend for their survival, thus ensuring the perpetuation of the plant species. Plants thus purposively associate with the animals for their perpetuation by reproduction, even if their leaves, branches, twigs, flowers, buds and fruits and roots are often eaten whole! They develop beautiful canopy, colorful flowers, tasteful fruits and useful medicinal and other properties for the purpose of ensuring association with animals.

7. Herbivore-Carnivore PPR and Evolution of Carnivores

Right from predator bacteria which prey on other bacteria up to the mammalian predators like lions and tigers that prey on the mammals, the most prominent PPR is carnivory of large animals. The constant tussle amongst different herbivores species to have complete feeding rights in a particular area leads to fights for common resources, which ends in the more powerful species having their complete sway, driving away the less powerful ones beyond the periphery.

However, the weaker species have their own requirements and somehow or the other they stake their claim on the resources. Finally, the struggle for common resources reaches such a hilt that a permanent solution in the form of elimination of the weaker herbivores dawns on the stronger ones. They find their endowments insufficient to kill the weaker ones and thus develop a strong urge to prey on them, for they were the ones responsible for resource depletion. Thus began the movement towards carnivory and there evolved in them all the traits necessary for the same. The emergence of carnivory not only lifts them up to a higher trophic level but also lets the same resources to be consumed by the remaining weaker herbivores, thereby granting evolutionary advantage to both.

8. Pet-Master PPR and the Urge for Domestication

The enormous disadvantage of being constantly under the threat of predation, some of the herbivores develop an urge for being protected by coming under the umbrella of domestication. By serving the purpose of the more intelligent, hence more powerful, humans, they not only guarantee for themselves protection from predators but also their own food security. Thus, the movement of the instinct for food towards a violent killer instinct in the predators is seen transformed into a docile instinct of helpfulness, service and friendship in these domesticated species. The urge to tackle successfully the brute force of the violent and powerful predators and to protect itself from natural calamities leads to a heightened sense of social and rational instinct that is seen in humanoid species at the next higher stage. The wild herbivores thus become mild pets for humans. The domestic animals thus have comparatively higher levels of intelligence and can reciprocate humans in an amazing range of feelings and activities. By accepting humans as masters, the pets have ensured evolution towards higher levels of intelligence transcending the instinctive mind.

9. Instinct-Intellect PPR and Evolution of Homo Sapiens

Faced with threat of predators in the jungle life, the formation of larger societies capable of tackling the same became very essential to the early humanoid species. Instinctive fights with such powerful predators were certainly not the solution. To counter brute force of ferocious predators like bears, wolves, tigers and lions etc. and to have food security, they needed to evolve in intelligence further to have the much-needed hunting and defending skills with help of different tools. Building dwelling places to counter vagaries of nature, domestication of animals, beginning of agricultural practices and formulation of unwritten principles of social life were the very first signs of higher intelligence dawning in the humanoid species which corresponded to the emergence of Homo sapiens. Such higher intelligence required a patient subduing of the instinctive mind to a more thoughtful and rational intellect, though it was not the complete elimination of the instincts. This we refer to as the intellect preying on the instinctive mind.

10. Intellect-Intuition PPR and Evolution beyond Human Stage

Morphological evolution reaches its acme and takes on a completely psychological character once human stage is reached. The evolution of the mind from the rudimentary stage of instincts in animals through the intermediate stage of intellect in humans now proceeds further along the track to a stage where the form remains human, but the method of perception becomes intuition. Just as there are different grades of intellectual ability manifest in different individuals, there are also different levels of intuitive perception depending on the stage of evolution. This giving way of the rational intellect to the faculty of intuition is here referred to as intellect-intuition PPR.

The instinctive aspect of the mind focuses on the external objects by possessing the respective organs which, by that activity get gradually emaciated. Thus, the vital urges prey upon the physical body. The higher intellect which should prey upon the vital urges to thin out instincts is also preyed upon by the latter if it is not itself guided by a purer and a subtler intellect bordering on intuition. At the highest stage intellect gets finished and stops functioning letting intuition its full manifestation. This can be seen as the complete extinction of intellect by the preying of intuition upon it.

The instinct functions with external objects, the intellect with internal objects or ideas while intuition goes beyond them and transcends space, time, matter, and idea etc. to endow one with direct perception of the truth of things. The individual mind expands beyond all boundaries as the intuition evolves and finally becomes one with the universal consciousness or the cosmic mind, thus completing the cycle of evolution that had originally issued forth from cosmic mind itself.

Since, it is true of every individual no matter at what stage of evolution it is, this can be referred to as self predation, as different higher levels of the same individual organism act as the predators for the levels below them. The lower self gets predated upon by the higher self in the ladder of selves that make up the individuals.

In the last three PPRs, there is a clear shift from the physical to the psychic domain and it becomes complete in the end, having come full circle to the cosmic mind.

11. Discussion

In generalizing and assigning PPR a significance deeper than has ever been done before, we have shown that, if generalized, it has the potential to explain the whole process of evolution across all trophic levels starting from inanimate particles to the highest psychological evolution in humans.

11.1 Importance of Commonalities in PPR

The above analysis has been done by discerning the common traits existing across trophic levels between the prey and the predator. For example at the level of interactions amongst non-living objects, the common character may be mass for gravitational interaction, charge for electromagnetic interaction and so on. At the level of plants inter-species and intra-species competition for sunlight from above or for minerals form below can be seen to be the common traits by which they try to perpetuate their existence at the expense of the others. In competing and striving to look attractive and taste delicious for different animal species to prey upon them, greenness of leaves, color and fragrance of flowers and tastefulness of fruits emerged in course of evolution. After this, insecta, amphibia, reptilia and so on are evolved by similar kind of mechanisms. Then, infighting for the same ecological niche, the utter enmity among mammalian herbivores led to mammalian carnivory. The common characteristic of fear of the wild carnivorous beasts among the mild herbivores led to the urge for domestication by humans and thus to the development of many common traits, which would foster symbiosis. These are but some of the glaring examples of common traits between the prey and the predator being utilized for perpetuation of species.

On reaching the human level when psychological evolution is yet to come out of the long associated bestiality dominated by the urge for possession resulting in fights over territory, food and partner, which manifest themselves most visibly among the lowest evolved homosapiens, living mostly at the level of instinctive mind. Gaining experience over hundreds of generations with the help of rational memory lodged in the cosmic mind, a gradual but definite evolution of the intellect can be seen in the middling categories. While in the previous level of the primitive human at the stage of hunter-gatherer the individual worked for its own pleasure and possession, it now works for the sake of its family, kith and keen and develops sharing and caring to a much larger extend than is seen in the instinctive animals. Accumulation of utility goods and their sharing amongst its clan becomes its preoccupation. Above which lies the stage of the further evolved intelligence that has astuteness and dexterity in exercising administrative control over larger territory with an expansive zeal for more power. Psychological evolution does not stop here and moves even further with sharper and a subtler intellect that tries to unravel the mysteries of nature, its whys and wherefores, leading to the doorsteps of intuitive perception of the ultimate reality behind and beyond the mind itself.

12. Evolutionary and Devolutionary Effects of PPR

The generalized PPR may be seen in operation at various levels of functional existence of a particular organism. Inasmuch as conscious urge determines future evolution, prey and predator may actually be evolving or regressing, as the case may be, into each other in the morphological sense in consequence of the predominance of the image of the one in the psyche of the other, be it acute shortage of prey for the predator or the morbid fear of being preyed upon by the predator. This may be facilitated by the corresponding form in the already existing morphic field to which the psyche of the creature becomes attached before dropping its previous encasement²¹.

This analysis of Prey-Predator Relationship proposed here as a core mechanism of evolution will be utilized in a future work to address issues of some unusual prey predator relationships such as: Plant parasitism, Plant carnivory and Role reversals²². Predation is as old as life itself. Predation interacted with other ecological or evolutionary forces to produce the specific biotas and food webs, thus evolution of the biosphere. Predator and prey interactions are the triggering force for evolution²³⁻²⁷.

13. Molecular basis of the Biotic and Abiotic Systems

A living system is autonomous self-reproducing "molecular systems" defined as a collective of self-organized communities of dynamic, interdependent, interacting and computing molecular species²⁸. The cytological components are said to be part of systems that integrate genes and proteins in a complex network of relations with many other cellular machinery and with features of the environment²⁹. However, are the proteins, ribosomes, membranes, nucleotides etc. to be classified as "biotic" or "abiotic"? It certainly depends on the view we take in defining the terms.

Once protein is ready, it becomes part of a larger level of organization. For example, it may become part of the structural framework of the cell, or it may become involved in enzymatic pathways for the synthesis or breakdown of cellular metabolites. Thus the protein is a part of the complex web of interactions. The activation, growth, and death of animal cells are accompanied by changes in the chemical composition of the surrounding environment. At molecular level, everything - every micro-molecule and every cell functions as both biotic and abiotic, as per the interaction. The determining factors in evolution are the molecular mechanisms and processes such as gene expression and they have eroded the idea of long-term rigidity of genes till definite mutations occurred. The epigenetic processes establish the fact of continuous changes in gene expression though they are imperceptible in the short-term basis (co-evolution). Gradual formation of epigenome by continous cultural selective pressures is one such example⁵. Thus the whole system is an inter-dependent system of its various components; the cells and organisms are not insulated and any change at the molecular level influences, and is influenced by, changes in the surrounding environment.

14. Cellular and sub-cellular PPR

The PPRs are truly ubiquitous. They are grossly represented by a variety of different populations such as rabbits and foxes, birds and moths etc. all of which fulfill a particular functional role: Predators need to feed on prey. In contrast, other forms of interaction structurally depend on the particular organisms that represent them and on their living conditions. These are the purposive interactions that determine the specificity of their relationship. The particular modes of interaction, such as whether inhabitants graze in a grassland, fly in the air or swim under rocks in water – all depend on the availability of the resources.

The ecological relations such as competition, predation, mutualism and metabolic cooperation also have cytological analogs. For example competition can be characterized in general as an interaction between two organisms or species that result in fitness gain. However, cells, proteins and other macromolecules also compete, where different cellular or molecular species 'compete for the same niche'. Chignola et al observed that cells bordering a growing tumor mass exploit their acquired capability to resist more acidic environment and take up more nutrients than non-cancerogenous cells in order to invade the surrounding tissue³⁰.

Competition is also there between cytological components. For example the survival and expansion of B lymphocytes depends upon specific interactions between antigens and immunoglobulin receptors and also specific B cell clones compete and are selected by the foreign antigens³⁰. Predation is a biological interaction in which a hunting organism (a predator) attacks and feeds on another organism (its prey), typically resulting in the death of the prey and predator's absorbing the victim's tissues. Intra-cellular predation occurring in a molecular system is constituted by macrophages, phagocytes that contribute to vertebrate immune system by engulfing and digesting cellular debris and pathogens.

Analogous interactions can also be found at the subcellular level, for example by looking at catalytic reactions that modify the structure of proteins, by inhibiting their normal function. The systems are analogous. As increasing the number of predators in a territory (e.g. tigers and wolves inhabiting a common territory) will increase the selective pressure on prey (e.g. rabbits), the number of bacteria in an organism or active proteins in a cell is proportional to the number of macrophages and enzymes do not feed on microbes and proteins in the same way foxes feed on rabbits. The phagocytation of microbes and the deactivation of enzymes represent the causal role of ecological predation, like, to control the size of specific populations. The mutualism also occurs in molecular level, for example, interactions between adjacent tissues during organogenesis by the process of embryonic induction³¹.

15. Weak Thought-Strong Thought PPR

As in the physical world, PPRs abound in the psychological domain of the individuals as well as of the species. Considering the fact that every action is preceded by a conscious willful thought, of which the physical activity is a mere translation in and through the physical world, it is logical to assume that both the predator and the prey in their struggle for survival use their urge to capture or to escape but when the predator succeeds, the urge of the prey to escape succumbs to the more vigorous urge of the predator to capture. By such success the predator's urge positively gets strengthened further. On the other hand, the urge of the prey to escape gets weakened further with an intensification of the fear of the predator in its psychic make-up³². Similarly, dominant thoughts in an individual can weaken and ultimately annihilate less powerful thoughts in an individual depending on the intensity of the operative urge. When the thought to scale the Mt. Everest or to become an Olympic medalist becomes predominant, it can kill numerous other thoughts which are not helpful for the achievement of such a purpose.

16. Conclusion

The ecological Prey-Predator system is sensitive to the efficiency of predator taking prey and ultimately determines the stability of the system. Nature is continuously operating on the system. Through the process, the predator is improving its abilities to capture prey and the prey is improving its abilities to avoid capture. Predators and prey respond continuously to each other's adaptations, which results in constant, although slow, co-evolution and changeful modes of interactions through epigenetic mechanisms.

The urge to survive is so strong that it even leads to role reversal in certain situations where the prey becomes the predator. This could have happened only through definite mechanisms of mutation over successive generations having faced serious threat to their survival from the predator species leading sometimes to extremely specialize preying techniques as in the case of epomis larva-frog and praying mantis-snake.

In PPRs, there is evolution of both species towards gaining more fitness to capture or escape as a means of ensuring survival. The predator and prey are co-evolving. The whole system exists as an interlinked web of prey and predator governed by the evolutionary urge itself. The law of evolution is the law of mutual purposive association. The ultimate goal of every animate and inanimate here is evolution. Every microcosm is a complete entity of the macrocosm with striking analogies. An evolutionary urge is operative everywhere in and through every being and thing through the purposive association, be it PPR or any other mode of interaction. For evolution by association with the higher, the lower becomes the prey to be utilized by the latter while the higher utilizes the lower in a predatory fashion to survive which is necessary for it to evolve to the next higher. This is the law of purposive association in operation.

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